

**A new species of Achatinidae  
from southern Africa  
(Mollusca: Gastropoda: Pulmonata)**

by

**W. F. Sirgel**

(Dept. of Zoology, University of Stellenbosch, South Africa)

ABSTRACT

A new species, *Archachatina marinae*, is described and compared with other closely related taxa. This small species represents the southernmost member of the genus.

INTRODUCTION

The pulmonate family Achatinidae, which is considered to be of Afrotropical origin (Van Bruggen 1978), is well represented in southern Africa (ie. south of the Zambesi River). At least 16 species of *Achatina* and 19 of *Archachatina* (subgenus *Tholachatina*) have been reported for this area (Van Bruggen 1965 1977). The majority of these species were, however, described solely on characters of the shell. Mead (1950 1979) emphasised that a meaningful evaluation of the relationships and phylogeny of this family can be reached only by taking into account both the characters of the shell and the anatomy of the genital system. Through lack of material he could only include a few South African species in his work on the comparative genital anatomy of Achatinidae (Mead 1950). Van Bruggen (1965) reported that the genital anatomy of only 9 species (23%) of South African Achatinidae had been described. Subsequently the genital systems of only a few additional species have been described or partially described (Van Bruggen 1966 1968 1985, Van Bruggen & Appleton 1977, Mead 1988).

The new species described in this paper was found in a forest of rather small trees belonging to the Tongaland-Pondoland Thicket phytochorological system (Moll *et al.* 1984) and situated on the farm Heuningbos (34°22'S:21°11'E) within 5 km of the sea. The mean annual rainfall of only 446,4 mm is evenly spread throughout the year. The rich growth of lichens on the trees, however, suggests an almost continuously high humidity in the area. This is probably the result of sea breezes and regular fog over the forest. Living specimens were always found about one centimetre below the surface of the sandy soil in areas of the forest where the canopy of the low-growing trees was less dense and allowed the sun to penetrate to the forest floor. Patches of shade-adapted grass grow among the trees in these areas.

The new species is the southernmost representative of the genus *Archachatina*. The genus *Achatina*, however, has apparently migrated even further south down the east coast of Africa and in a westerly direction along the south coast. I have

found *Achatina zebra* (Bruguière, 1792) distributed as far west as Witsand on the northeastern banks of the Breë River (34°23'S:20°50'E). Shells of this species have been found at Cape Agulhas, which is the southernmost tip of Africa; however, no reliable record exists of this species living there. A colony of *A. zebra* occurring in the Hout Bay area of Cape Town, significantly further westwards, is believed to have been transported by man and is thus not regarded as representing the natural southward migration of the family.

***Archachatina (Tholachatina) marinae* sp. n.**

**Derivation:** Named for my wife Marina. The name also seems appropriate as the species occurs near the sea.

**Diagnosis:** A small species; shell with  $5\frac{1}{2}$  convex whorls, about 40 mm long, fairly slender, with flame pattern, blunt dome-shaped apex.

**Material examined:** Holotype: SOUTH AFRICA, *Cape Province*, Riversdale Dist., Farm Heuningbos, 34°22'S:21°11'E, 100 m, 9 September 1986, W. F. Sirgel (Natal Museum, No. E5324/T74); Paratypes: same data (6); ibidem, 15 September 1987 (3); 15 October 1987 (3). All these specimens were drowned and afterwards preserved in 70 % alcohol. A further 49 dry shells were collected on 5 May 1985 and were used together with the holotype for measurements of the shell (Table 1, Holotype = No. 36). The paratypes have been deposited in the following institutes: Natal Museum, Pietermaritzburg, South Africa (3 preserved specimens + 25 dry shells given uneven numbers in Table 1); South African Museum, Cape Town, South Africa (3 + 8 dry shells); Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands (3 + 8); Musée Royal de l'Afrique Centrale, Tervuren, Belgium (3 + 8); British Museum (Natural History), London (3 + 8).

A further 12 specimens were dissected in a study of the anatomy of the genital system. Three of these were extracted from the shells (Nos. 9, 27, 46 in Table 1), after placing the drowned specimens in boiling water for a few minutes. Serial sections for microscopic examination were made using the genital system from shell No. 9. The remaining 9 specimens were dissected fresh after breaking the shells.

The genital systems of four specimens of *A. ustulata* (Lamarck, 1822) from Knysna (length of shells 70–91 mm) and three specimens of *A. machachensis* Smith, 1902 from Roma in Lesotho (length of shell 44–46 mm) were dissected for comparative purposes. Average measurements of these systems were used with others made by Dr Mead (1988, pers. comm.) from the genital systems of four smaller (shell length 49–56,4 mm), though not necessarily younger, specimens of *A. ustulata*, to compile Table 2.

In accordance with the method used by Van Bruggen (pers. comm.) the outer rim of the callus is included in the measurements of the shell aperture width given in Table 1. The number of whorls is also determined by Van Bruggen's method which results in a count of a half whorl less than the method of Adam (1954).

**Description:** Shell (Fig. 1) small, hardly exceeding 40 mm in length (Table 1), rather slender and somewhat elongate or narrowly clavate, widest at mid-length, imperforate, with produced spire, thin but solid, translucent and fairly shiny. Whorls  $5\frac{1}{2}$ , decidedly convex, separated by well-impressed and somewhat crenulate

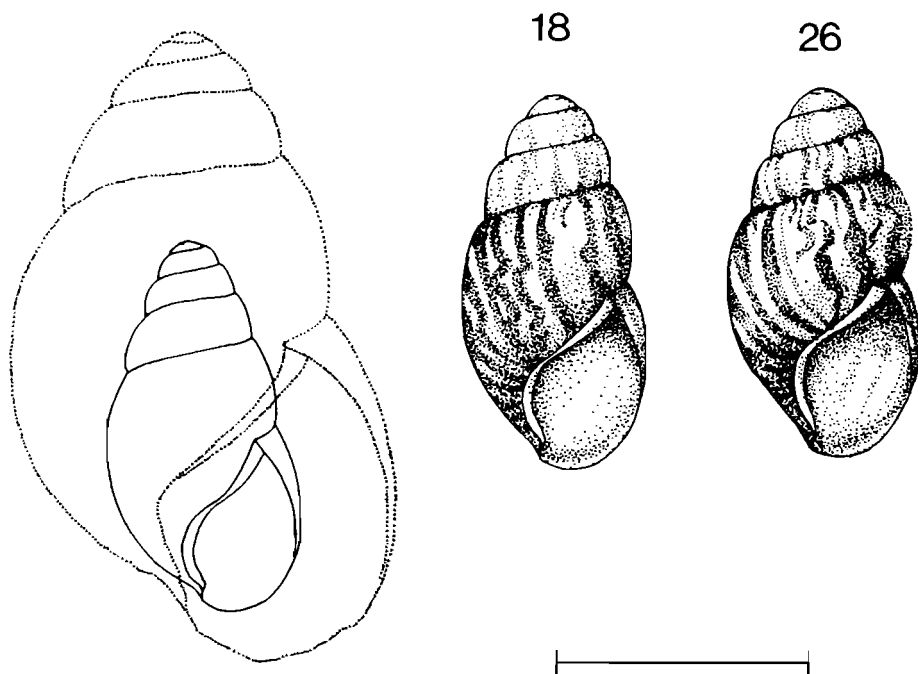


Fig. 1. Outline of extremes in shell size of *Archachatina machachensis* (Smith) (redrawn from Van Bruggen, 1985) and two shells of *Archachatina marinae* sp. n. (Nos. 18 & 26 of Table 1). Scale = 25 mm.

sutures, apical whorls forming a broad dome; the first flattened, remainder gradually increasing in length and width. Body whorl narrow and occupying 75% of total length of shell, about as convex as penultimate whorl. Aperture acuminate ovate (see Table 1 for dimensions), with evenly curved semi-elliptic outer margin. Inside white with flame pattern discernible through translucent wall. Outer lip thin and sharp. Parietal callus thin and white. Columella white, narrow, slightly concave, obliquely truncate close to base. Apical  $3\frac{1}{2}$  whorls covered with a finely beaded spiral sculpture (practically indiscernible to naked eye) which shows signs of weakening on penultimate whorl. On body whorl this spiral sculpture limited to a narrow subsutural band covering only about one-fifth height of whorl. Entire body whorl bears fairly coarse growth striae. Olivaceous yellow background with thin, straight, oblique or slightly wavy, vertical, occasionally interrupted chestnut streaks of unequal width on last  $2-2\frac{1}{2}$  whorls. Width of streaks slightly less than that of ground colour between them.

Body grey with two yellow streaks extending between collar of mantle and bases of ommatophores. Genital system (Fig. 2) conforms to basic pattern of subgenus *Tholachatina*. Ovotestis embedded in lobes of liver just apical to stomach. Talon, situated at point where hermaphrodite duct enters albumen gland, is 1.7 mm long, tubular with globular dilated apical end.

Basal genital structures: for numerical data see Table 2. Apical vas deferens (AVD), free oviduct (FO) and spermathecal duct (SD) of similar length (Fig. 2)

TABLE 1

Shell measurements of *Archachatina marinae* sp. n. (mm), d = diameter, l = length, lbw = length of body whorl, mw = maximum width. The 'A' added to some of the specimen numbers indicates specimens taken alive. Holotype = 36A.

No.	Whorls	Shell l × d	Aperture l × mw	lbw	l/d ratio
1	S <sub>1</sub> <sup>1</sup>	40,7 × 22,5	19,5 × 12,9	30,0	1,81
2	S <sub>2</sub> <sup>1</sup>	40,4 × 22,2	19,0 × 13,1	30,7	1,82
3	S <sub>3</sub> <sup>1</sup>	40,4 × 22,2	17,6 × 12,8	29,6	1,82
4	S <sub>4</sub> <sup>1</sup>	39,8 × 22,0	19,1 × 13,3	30,4	1,81
5	S <sub>5</sub> <sup>1</sup>	39,6 × 21,8	17,4 × 13,0	28,4	1,82
6	S <sub>6</sub> <sup>1</sup>	39,45 × 21,9	18,6 × 13,1	30,3	1,80
7	S <sub>7</sub> <sup>1</sup>	39,3 × 21,3	18,3 × 12,7	29,0	1,85
8	S <sub>8</sub> <sup>1</sup>	39,3 × 20,5	18,25 × 12,3	29,1	1,92
9A	S <sub>9</sub> <sup>1</sup>	39,3 × 21,0	18,1 × 12,5	29,1	1,87
10	S <sub>10</sub> <sup>1</sup>	38,9 × 21,2	18,0 × 12,5	29,3	1,84
11	S <sub>11</sub> <sup>1</sup>	38,85 × 21,6	17,8 × 12,9	28,1	1,80
12	S <sub>12</sub> <sup>1</sup>	38,5 × 20,9	18,1 × 12,7	28,4	1,84
13	S <sub>13</sub> <sup>1</sup>	38,5 × 20,7	18,2 × 12,5	28,3	1,86
14	S <sub>14</sub> <sup>1</sup>	38,05 × 21,1	18,2 × 13,0	28,7	1,80
15	S <sub>15</sub> <sup>1</sup>	38,0 × 21,1	18,1 × 12,7	28,5	1,80
16	S <sub>16</sub> <sup>1</sup>	37,65 × 20,95	18,0 × 12,0	28,3	1,80
17	S <sub>17</sub> <sup>1</sup>	37,25 × 20,95	17,0 × 12,4	27,9	1,78
18	S <sub>18</sub> <sup>1</sup>	37,25 × 20,25	18,3 × 12,1	27,8	1,84
19	S <sub>19</sub> <sup>1</sup>	37,2 × 20,4	17,8 × 12,4	28,0	1,82
20	S <sub>20</sub> <sup>1</sup>	37,1 × 20,8	18,0 × 12,4	28,0	1,78
21	S <sub>21</sub> <sup>1</sup>	37,0 × 21,0	17,7 × 12,5	28,3	1,76
22	S <sub>22</sub> <sup>1</sup>	36,9 × 21,1	17,4 × 12,5	28,0	1,75
23	S <sub>23</sub> <sup>1</sup>	36,85 × 20,7	17,5 × 12,7	27,6	1,78
24	S <sub>24</sub> <sup>1</sup>	36,65 × 20,7	17,5 × 12,3	28,2	1,77
25	S <sub>25</sub> <sup>1</sup>	36,6 × 20,2	18,5 × 12,3	28,3	1,81
26	S <sub>26</sub> <sup>1</sup>	36,5 × 21,5	17,8 × 12,3	27,9	1,70
27A	S <sub>27</sub> <sup>1</sup>	36,4 × 21,1	17,8 × 12,7	27,9	1,73
28	S <sub>28</sub> <sup>1</sup>	36,3 × 19,7	16,7 × 11,5	26,8	1,84
29	S <sub>29</sub> <sup>1</sup>	36,3 × 20,5	18,1 × 12,6	28,4	1,77
30	S <sub>30</sub> <sup>1</sup>	36,25 × 20,7	17,9 × 12,6	27,1	1,75
31	S <sub>31</sub> <sup>1</sup>	36,1 × 20,1	17,6 × 12,1	27,2	1,80
32	S <sub>32</sub> <sup>1</sup>	35,95 × 20,0	17,6 × 11,8	27,4	1,80
33	S <sub>33</sub> <sup>1</sup>	35,7 × 19,8	16,0 × 12,0	26,6	1,80
34	S <sub>34</sub> <sup>1</sup>	35,6 × 19,8	16,9 × 12,2	26,2	1,80
35	S <sub>35</sub> <sup>1</sup>	35,6 × 21,3	17,3 × 12,7	27,4	1,67
36A	S <sub>36</sub> <sup>1</sup>	35,3 × 19,85	—	—	1,78
37	S <sub>37</sub> <sup>1</sup>	34,75 × 20,5	17,4 × 12,2	26,7	1,70
38	S <sub>38</sub> <sup>1</sup>	34,75 × 19,9	17,7 × 11,8	27,1	1,75
39	S <sub>39</sub> <sup>1</sup>	34,75 × 20,5	16,6 × 12,5	25,9	1,70
40	S <sub>40</sub> <sup>1</sup>	34,65 × 18,8	17,6 × 11,0	26,7	1,84
41	S <sub>41</sub> <sup>1</sup>	34,55 × 19,25	16,0 × 11,1	25,6	1,80
42	S <sub>42</sub> <sup>1</sup>	34,55 × 19,65	17,6 × 12,0	26,8	1,76
43	S <sub>43</sub> <sup>1</sup>	34,2 × 18,6	17,4 × 11,1	26,6	1,84
44	S <sub>44</sub> <sup>1</sup>	34,0 × 18,6	15,8 × 11,3	25,8	1,83
45	S <sub>45</sub> <sup>1</sup>	33,75 × 18,9	17,5 × 11,5	26,8	1,79
46A	S <sub>46</sub> <sup>1</sup>	33,35 × 19,75	17,3 × 11,5	25,7	1,69
47	S <sub>47</sub> <sup>1</sup>	33,1 × 19,0	15,8 × 10,8	25,2	1,74
48	S <sub>48</sub> <sup>1</sup>	33,1 × 19,0	17,3 × 11,5	26,0	1,74
49	S <sub>49</sub> <sup>1</sup>	32,4 × 19,4	17,5 × 11,5	25,9	1,67
50	S <sub>50</sub> <sup>1</sup>	32,05 × 18,3	16,5 × 11,0	25,0	1,75

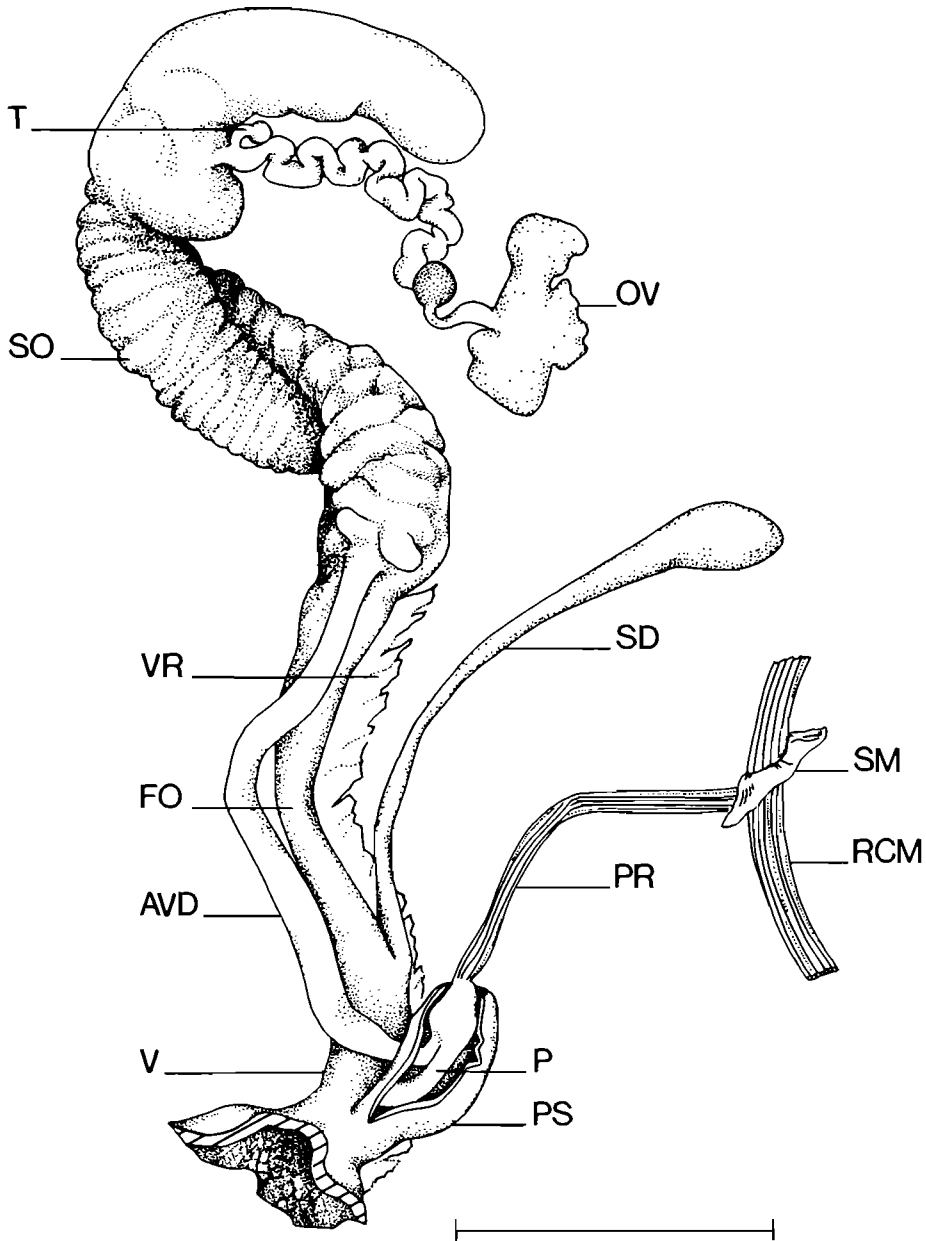


Fig. 2. *Archachatina marinae* sp. n. genital system in dorsal view. Penis sheath cut longitudinally to show penis. AVD = Apical vas deferens, FO = Free oviduct, OV = Ovotestis, P = Penis, Pr = Penial retractor, PS = Penis sheath, RCM = Right band of columellar retractor muscle, SD = Spermathecal duct, SM = Sagittal myoseptum, SO = Spermoviduct, T = Talon, V = Vagina, VR = Vaginal retentor. Scale = 10 mm.

TABLE 2

Average measurements (mm) of the genital systems of *Archachatina ustulata*, *A. machachensis* and *A. marinae* sp. n. The first column depicts the average measurements of four specimens of *A. ustulata* dissected and measured Dr A. R. Mead.

Structure	<i>A. ustulata</i> (Mead) (4 specs.)	<i>A. ustulata</i> (4 specs.)	<i>A. machachensis</i> (3 specs.)	<i>A. marinae</i> (5 specs.)
P – length	3,9	7,2	14,7	6,0
„ – diam.	2,0	1,8	1,0 & 3,0	0,7 & 0,9
PS – length	6,3	9,0	9,1	6,0
„ – diam.	2,1	2,8	3,0	1,9
PR – length	11,4	23,0	16,0	13,5
„ – width	1,3	1,4	1,1 & 4,2	0,9
BVD – length	1,3	4,0	8,5	2,25
„ – diam.	1,3	0,7	0,75	0,5
AVD – length	19,5	30,2	23,7	18,5
„ – diam.	1,6	1,95	1,0	0,9
V – length	8,1	13,0	11,1	5,0
„ – diam.	2,4	2,5	1,7	1,5
Width FO/SD } junction }	3,5	3,0	3,25	1,8
SD – length	12,6	17,5	10,3	16,5
„ – diam.	1,3	1,2	0,7	0,4
S – length	7,6	5,0	9,8	4,0
„ – diam.	2,7	3,0	3,1	1,9
FO – length	12,1	17,0	11,5	14,2
„ – diam.	1,5	1,95	1,35	1,3
Talon – length	1,7	–	2,0	1,75
„ – diam.	0,9	–	0,4 & 1,0	0,25 & 0,7

and about three times length of vagina (V). Capitate spermatheca attached to spermoviduct (SO) above junction of AVD and FO. A thin, translucent, membranous, connective tissue-like vaginal retentor (VR) extending along length of vagina and FO inserts on right body wall along line between genital atrium and conjunction of right edges of mantle and diaphragm with right body wall.

Penis sheath (PS) completely encloses clavo-capitate penis (P) without extending above it. Except for a few thin muscle fibres from penis retractor (PR) which run along basal vas deferens (BVD) to insert on PS, inner surface of latter free from outer surface of P. Thin wall of PS consists of an outer layer of longitudinal muscle fibres and an inner layer of circular muscle fibres twice as thick as longitudinal layer. Long PR slender along entire length and only lightly embraces apex of penis at its origin without obscuring relationships of apical P and BVD from view (Figs 3 & 4). It inserts on columellar muscle band of right side at its junction with sagittal myoseptum (SM) well posterior of point where tentacle retractor and retractor of ommatophore of that side merge.

From dorsal view P has an asymmetrical clavo-capitate appearance (Fig. 4) consisting of a long slender basal penis (BP) and a bulbous apical penis (AP). In ventral view (Fig. 3) arched BVD can be seen to be partly embraced by a longitudinal groove (GR) extending along apical part of BP and base of AP. This groove gives impression, in ventral view, of an indentation from side facing V. Presence of groove causes wall of P to invaginate longitudinally into penial lumen resulting in it taking on a more or less crescent shape in cross-section. Relatively

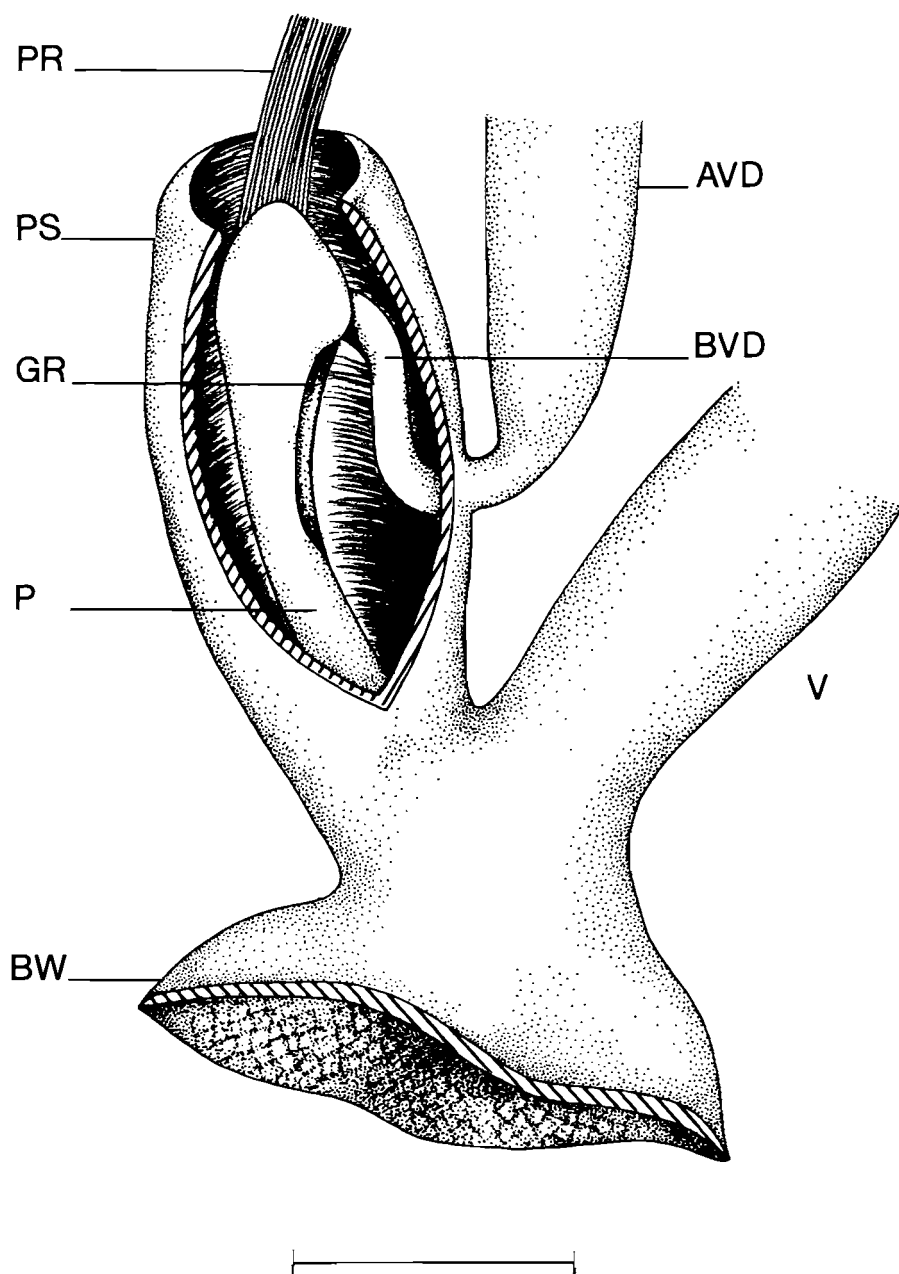


Fig. 3. *Archachatina marinae* sp. n. basal genitalia in ventral view. Penis sheath cut longitudinally and spread laterally to show penis and basal vas deferens. AVD=Apical vas deferens, BVD = Basal vas deferens, BW=Body wall, GR=longitudinal groove on surface of penis embracing BVD in living condition, P=Penis, PR=Penial retractor, PS=Penis sheath, V=Vagina. Scale=5 mm.

thin wall of BP bears subdued, longitudinal rugosities on inner surface and is histologically dominated by longitudinal muscle fibres. In contrast, lumen of AP is dilated and its wall is somewhat thinner and without rugosities.

Instead of being situated at crest of elongated invagination of penial wall, aperture of conduit leading from P to BVD arises in dorsal aspect of groove. Thus in dorsal view, canopy-like AP (Fig. 4) obscures groove and its relationship to BVD. No verge or pilaster is contained within P. Although longitudinal invagina-

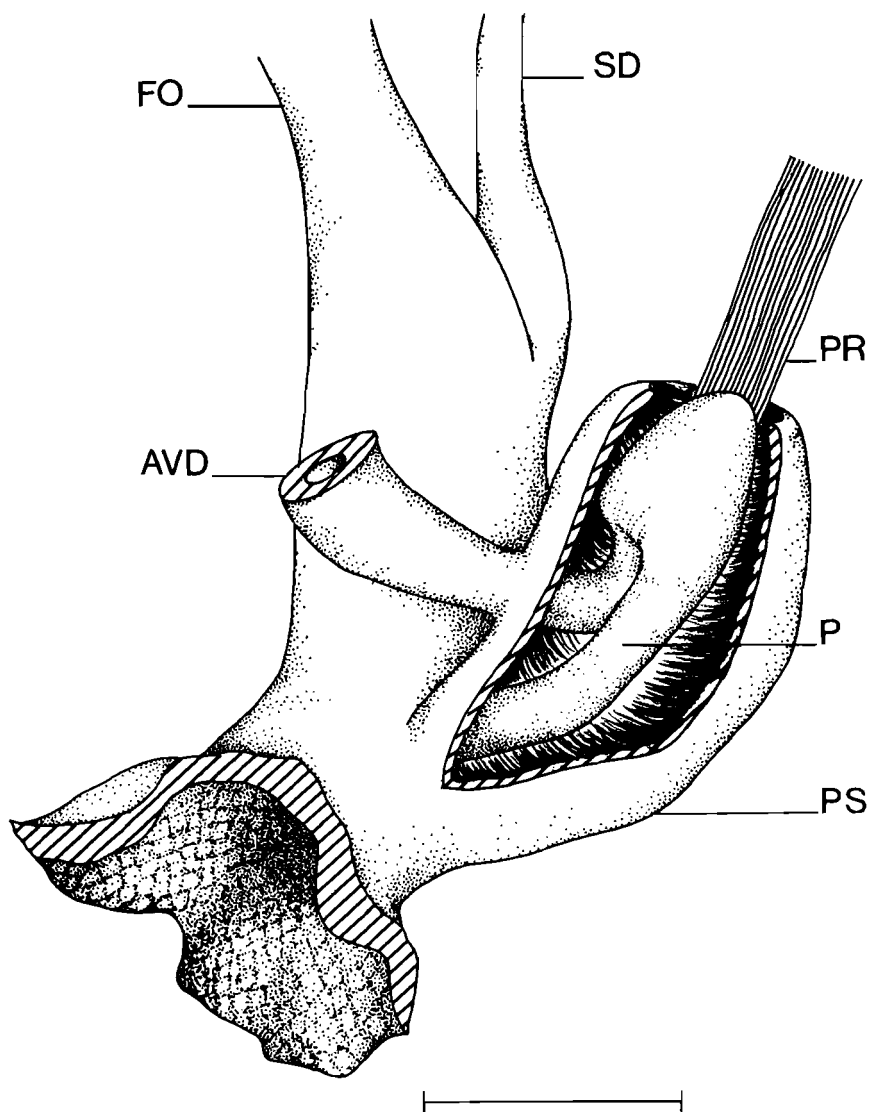


Fig. 4. *Archachatina marinae* sp. n. basal genitalia in dorsal view. Penis sheath cut longitudinally and spread laterally. AP=Apical penis, AVD=Apical vas deferens, BVD=Basal vas deferens BW=Body wall. Scale=5 mm.



tion of penial wall may appear to be a pilaster in a longitudinally incised P, it cannot function as such as it does not represent a thickening of penial wall.

BVD extends, basally, along BP for a short distance and then turns to penetrate PS midway. It has a very small lumen and wall mainly consists of longitudinal muscle fibres. As vas deferens emerges from PS it greatly enlarges and sometimes more than doubles to become AVD which follows direct route to base of spermoviduct, where it joins FO. Its wall mainly consists of a thick layer of circular muscle fibres.

Lumen of relatively short, muscular vagina lined by strong longitudinal rugosities. These are continued apically of junction of SD to line lumen of much longer, muscular FO (Table 2) while a few enter long slender SD. Genital atrium very short.

In one specimen, drowned on September 1986 and immersed in boiling water followed by fixation in 70% alcohol, measurement of basal genital structures

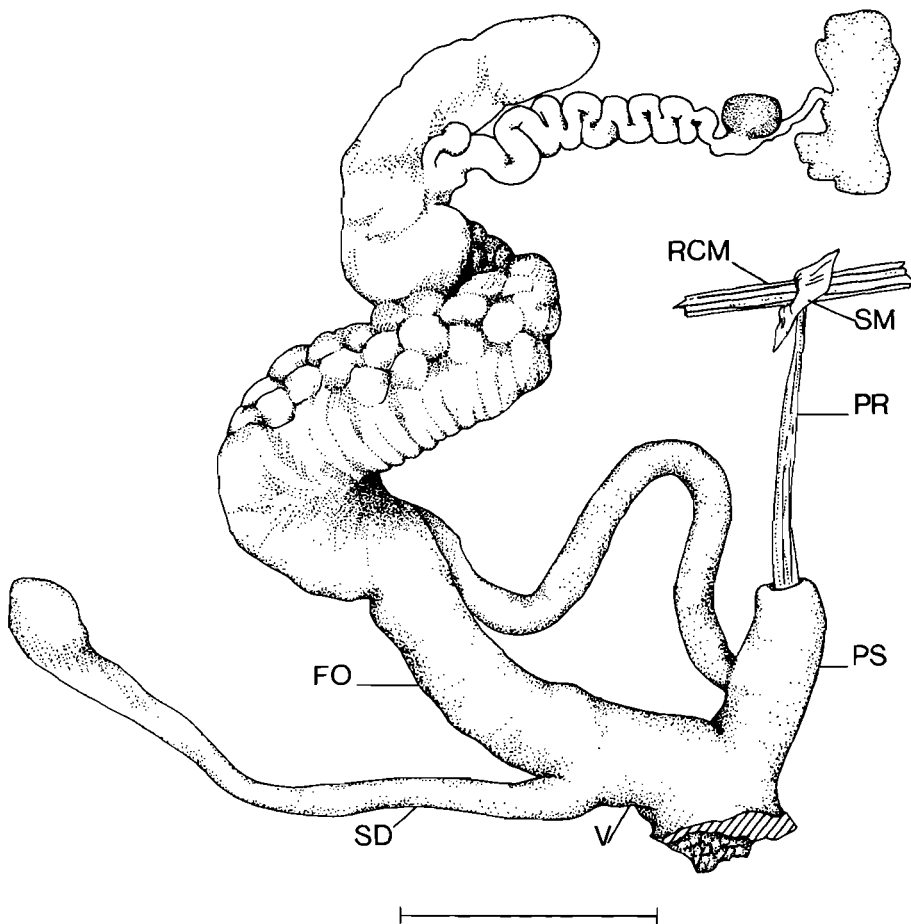


Fig. 5. *Archachatina marinae* sp. n. genital system of abnormal specimen in dorsal view. FO=Free oviduct, PS=Penis sheath, V=Vagina. Scale=10 mm.

deviated so much from those found in other specimens that it was clearly an abnormal specimen (Fig. 5). In this case diameter of SD is twice that of FO and V about three times that shown in Table 2. Consequently, this specimen was not used for the calculation of the averages shown in Table 2. This condition probably due to poor fixation. The fact that the basal part of SD and vagina was also found to be filled by large numbers of parasitic protozoa of the family Trichodinidae could have contributed to this obviously atypical condition.

#### DISCUSSION

By virtue of the small size and slender shape of the shell, *A. marinae* falls into the same category as *A. livingstonei* (Melvill & Ponsonby, 1897), *A. pentheri* (Sturany, 1898), *A. sandgroundi* Bequaert, 1950, *A. transvaalensis* (Smith, 1898), *A. aenigmatica* Van Bruggen, 1977 and the smaller form of *A. machachensis*, thus clearly excluding the possibility of confusion with the larger and the obese southern African forms within the subgenus. *A. livingstonei*, *A. pentheri*, *A. sandgroundi* and *A. transvaalensis* differ from *A. marinae* in that their shells have a more slender and elongated shape, less convex whorls, decidedly narrower apex and the maximum diameter being further towards the base of the shell. *A. transvaalensis* also differs in the absence of a flame pattern on the pale yellow shell, while that of *A. pentheri* bears a much coarser granulation.

The two species that seem to approach *A. marinae* nearest as regards shell shape are *A. weberi* Bequaert, 1950 and *A. aenigmatica*. Bequaert described the first-mentioned from mossy rain forests and *Podocarpus* stands in the Imatong Mountains (4°15'N:32°31'E—altitude 6 200–8 700 ft) and regards it to be related to species from northeastern Africa. According to his figures and description, the whorls seem slightly less convex and the granulation more coarse than that of *A. marinae*. Allowing for the limited variation, mainly obesity (Table 1 Nos. 8 & 22, Fig. 1), and a possible variation in the flame pattern of the shell of *A. marinae* there seems to be little, if any, difference between it and the shell on which Van Bruggen (1977) found the species *A. aenigmatica*. The fact that the type-locality of the last-mentioned is Victoria Falls in Zimbabwe, which is far inland (17°56'S:25°51'E) and at an altitude of about 1 000 m, makes it highly improbable that it is the same species. Yet another similar shell is that of the smaller form of *A. machachensis*. On close comparison it, however, clearly exhibits less convexity of whorls, a narrower apex and a more shiny shell.

As Mead (1950 1979) indicated, the characters of the shell alone are not sufficient for establishing relationships between different species. This is confirmed by Van Bruggen's (1985) description of the extreme variation found in the size and shape of the shells of *A. machachensis*. Such variation within a single species implies that, despite a much bigger and more elongate shell, *A. ustulata* could be closely related to *A. marinae*. This assumption is in fact strengthened by the geographical distribution of these species. *A. ustulata* occurs in an area only about 75 km to the east and slightly to the north of the type-locality of *A. marinae* and is the only other known species of *Archachatina* in the vicinity. Both species are forest dwellers. Mead (pers. comm.) has also examined their genital systems and I agree with his view that the anatomies suggest a close relationship. He further pointed out that

the coastal *A. ustulata* appears to be 'most closely' related to the montane *A. machachensis* as well as to *A. vestita* (Pfeiffer, 1855) from the east coast of southern Africa (Mead 1988). Van Bruggen (1966) hinted that there could be close relationships between *A. vestita* and *A. simplex crawfordi* (Morelet 1889). He also expressed the view that *A. machachensis* and *A. ustulata* are closely related (Van Bruggen 1970).

The assumption that a close relationship exists between *A. ustulata*, *A. machachensis* and *A. marinae* may raise the question as to whether they are not merely ecotypes of the same species, especially as shells of *A. ustulata* occurring in more open country and to the southwestern limits of its area of distribution tend to be smaller, often with more convex whorls. The following differences in the anatomy of their genital systems, however, suggest that *A. marinae* is indeed a valid species.

1—In contrast to the comparatively slender PR of *A. marinae* which only lightly embraces the apex of the P at its origin, the PR of *A. ustulata* broadly enshrouds the apical P and BVD and extends down to the BP, completely obscuring the relationships of the AP and BVD (Mead 1988). The PR of *A. machachensis* is bipartite consisting of a slender apical part and a massive triangular basal penial retractor muscle (BPR). In ventral view it greatly obscures the relationships between it, the AP and the BVD whilst the muscle strands embrace from one-half to all of the dorsal surface of the AP (Van Bruggen 1985).

2—The PS of *A. ustulata* extends a short distance above the AP (Mead 1988) while the AP and a part of the BVD extend beyond the PS in *A. machachensis* (Van Bruggen 1985). In *A. marinae* the penis runs through the entire length of the PS without extending beyond it. Similar to the condition in *A. machachensis*, the PR of *A. marinae* inserts on the columellar muscle band of the right side at its junction with the sagittal myoseptum, well posterior to the point where the tentacle retractor and retractor of the ommatophore of that side merge. In contrast to this, according to Mead (1988), the PR of *A. ustulata* inserts on a long, right tentacle retractor which fuses with the right retractor of the ommatophore far more posterior in the columellar muscle system than is the case in *A. machachensis*.

3—The BP of *A. ustulata* is thick-walled with coarse, longitudinal, internal plicae while the AP is more slender, thin-walled and bears internal rugae (Mead 1988). Contrary to this condition, the BP of *A. machachensis* is thin-walled with longitudinally orientated rugae, while the asymmetrical AP is thick-walled and has deep recesses in a tight reticulate network of rugae. *A. marinae* differs from both these species in that the BP has a relatively thin muscular wall bearing subdued longitudinal rugae on its inner surface, while the wider AP has a slightly thinner wall without any noticeable rugae or other elaborations on the internal surface.

4—The AVD of *A. ustulata* is thick having more or less the same calibre as the FO (Fig. 6). Those of *A. marinae* and *A. machachensis* are clearly more slender than the FO (Fig. 2; Table 2).

5—The V of *A. ustulata* is much longer than the PS and almost as long as the FO and the SD. In *A. machachensis* the V is only slightly longer than the PS but almost as long as the FO and SD. This implies that the PS is relatively longer than that of

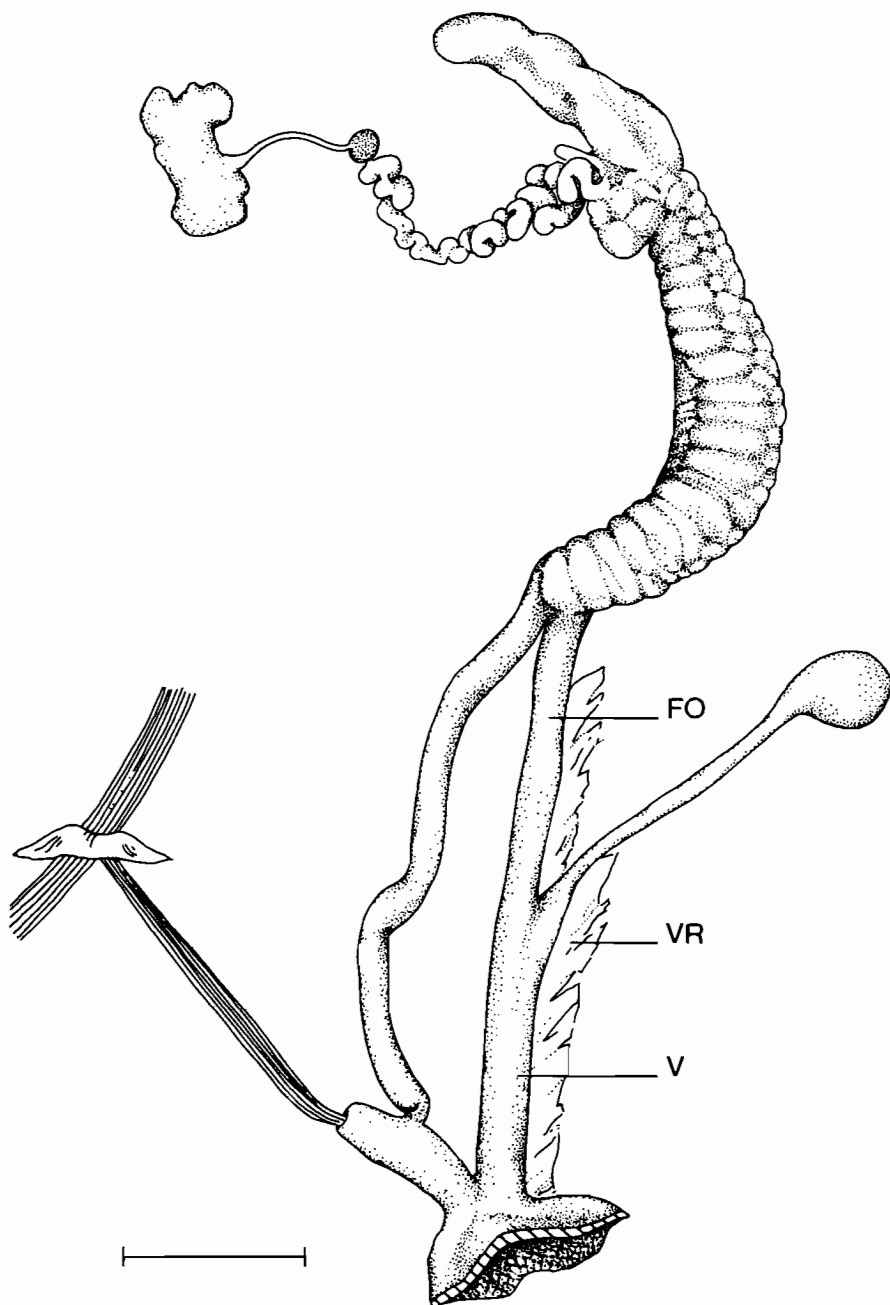


Fig. 6. *Archachatina ustulata* (Lamarck) genital system in ventral view. FO = Free oviduct, V = Vagina, VR = Vaginal retentor. Scale = 10 mm.

*A. ustulata*. In the case of *A. marinae* the V is very short, more or less as long as the PS and only about one-third of the length of the FO and SD (Table 2). This implies that the SD is relatively much longer than that of the other two species.

6—The junction of the FO and SD at the apex of the V in *A. machachensis* is wide, forming a noticeable bulge in the conduits. Although a widening is also formed by this junction in both *A. ustulata* and *A. marinae* it is far less defined (Figs 2 & 6, Table 2).

Some points of correspondence between these three species are: In none of them does the penis contain a verge or pilaster, a condition that seems to be common in the subgenus *Tholachatina*. A very intimate relationship between the BVD and P exists in all three species as the BVD is at least partly embraced by a longitudinal groove or concavity on the wall of the P (fide Van Bruggen 1985, Mead 1988).

In accordance with this, the exit of the BVD from the penis is dorsal in the apical context. Mead (1950) figures a condition of this type for *A. simplex crawfordi*, although the groove on the penial wall in that case seems much more pronounced than that in *A. marinae*. According to Van Bruggen (1985) the dorsal exit of the BVD from the penis is reminiscent of the condition found in *A. dimidiata* (Smith, 1878), *A. zuluensis* (Connolly, 1939) and *A. simplex crawfordi*. A closer examination of the remaining southern African *Archachatina* (*Tholachatina*) species will probably reveal that these conditions are quite common among them. In addition the three above-mentioned species are similar in that the AVD is much thicker than the BVD and from its emergence, midway on the PS, takes a direct route towards its point of fusion with the FO.

The penes of both *A. ustulata* and *A. marinae* being fully contained within the PS and that of *A. machachensis* extending only for a short distance above it, according to the views of Mead (1950), represents a relatively primitive condition within the genus of *Archachatina*.

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